**The Search for Interstellar Sulfide Grains**

Lindsay P. Keller and Scott Messenger

Mail Code KR, NASA Johnson Space Center, Houston, TX 77058

The lifecycle of sulfur in the galaxy is poorly understood. Fe-sulfide grains are abundant in early solar system materials (e.g. meteorites and comets) and S is highly depleted from the gas phase in cold, dense molecular cloud environments. In stark contrast, sulfur is essentially undepleted from the gas phase in the diffuse interstellar medium, indicating that little sulfur is incorporated into solid grains in this environment. It is widely believed that sulfur is not a component of interstellar dust grains. This is a rather puzzling observation unless Fe-sulfides are not produced in significant quantities in stellar outflows, or their lifetime in the ISM is very short due to rapid destruction.

Fe sulfide grains are ubiquitous in cometary samples where they are the dominant host of sulfur. The Fe-sulfides (primarily pyrrhotite; $Fe_{1-x}S$) are common, both as discrete 0.5-10 μm-sized grains and as fine (5-10 nm) nanophase inclusions within amorphous silicate grains. Cometary dust particles contain high abundances of well-preserved presolar silicates and organic matter and we have suggested that they should contain presolar sulfides as well. This hypothesis is supported by the observation of abundant Fe-sulfides grains in dust around pre- and post-main sequence stars inferred from astronomical spectra showing a broad 23 μm IR feature due to FeS. Fe-sulfide grains also occur as inclusions in *bona fide* circumstellar amorphous silicate grains and as inclusions within deuterium-rich organic matter in cometary dust samples. Our irradiation experiments show that FeS is far more resistant to radiation damage than silicates. Consequently, we expect that Fe sulfide stardust should be as abundant as silicate stardust in solar system materials.